

Fig. 1

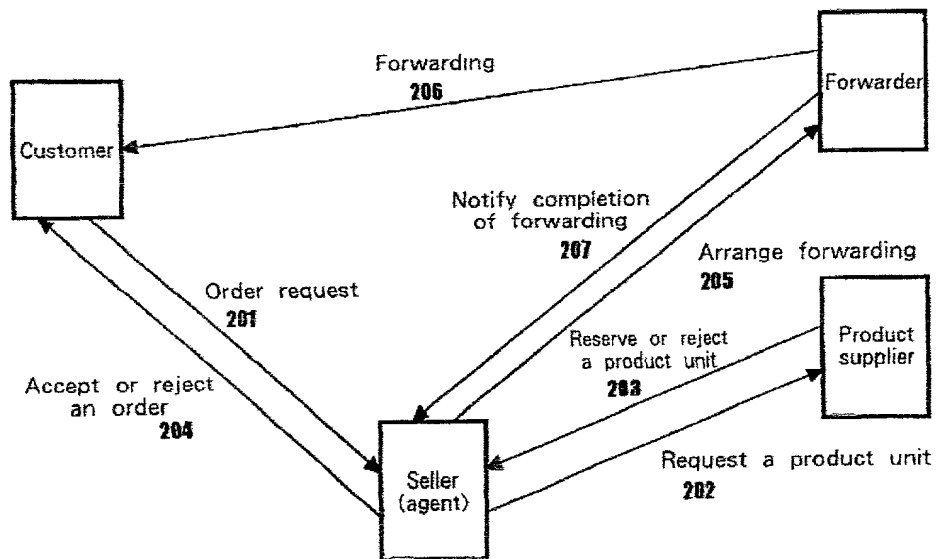
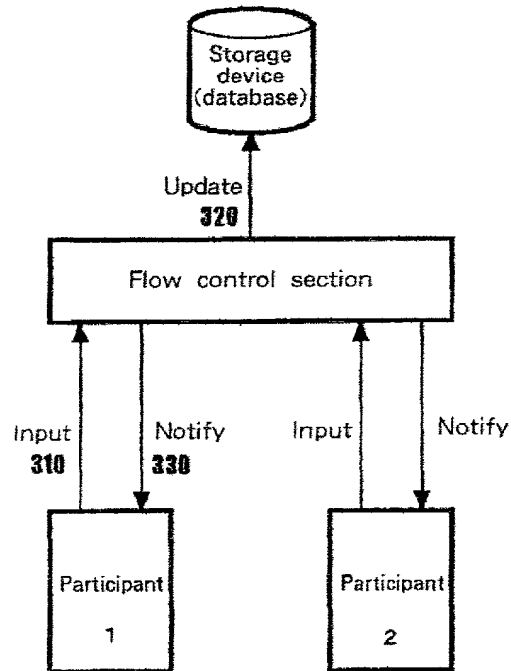
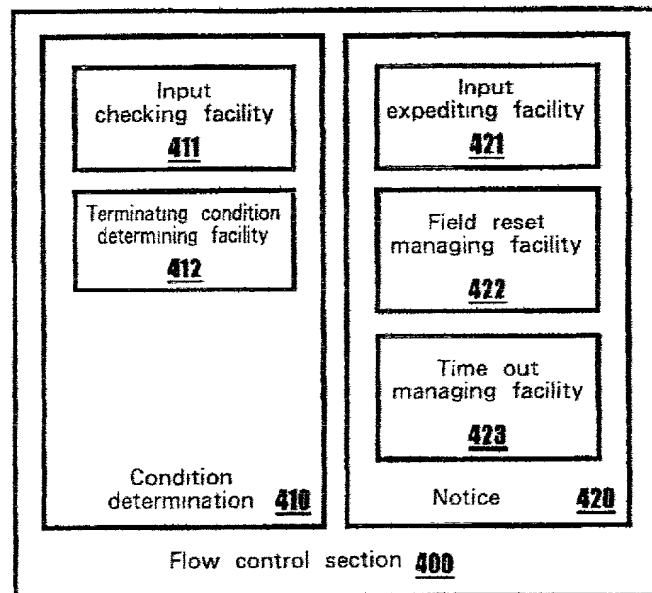
Typical inter - company workflow

Fig. 2



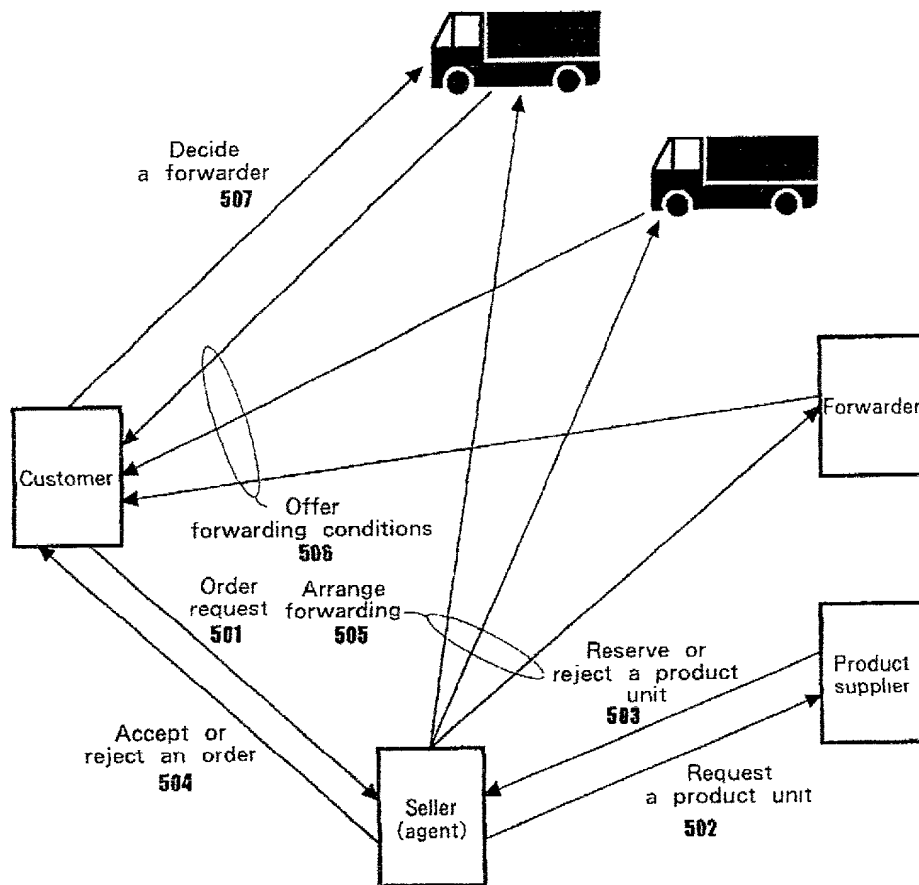
Overview of a workflow controlling system

Fig. 3



Structure of a flow control section

Fig. 4



Workflow including a bid from a forwarder

Fig. 5

Contents
 Tree structure
 (Node, [value])
 History
 (Time, person, action, node ID)
 Access Control
 (Node ID, tag name, person, role, action, conditional expression)
 Constrains
 (Conditional expression)
 Dependencies
 (Depended node ID, Dependent node ID)
 Termination
 (Type, conditional expression)
 Type: End or Abort

[A] means that A is optional

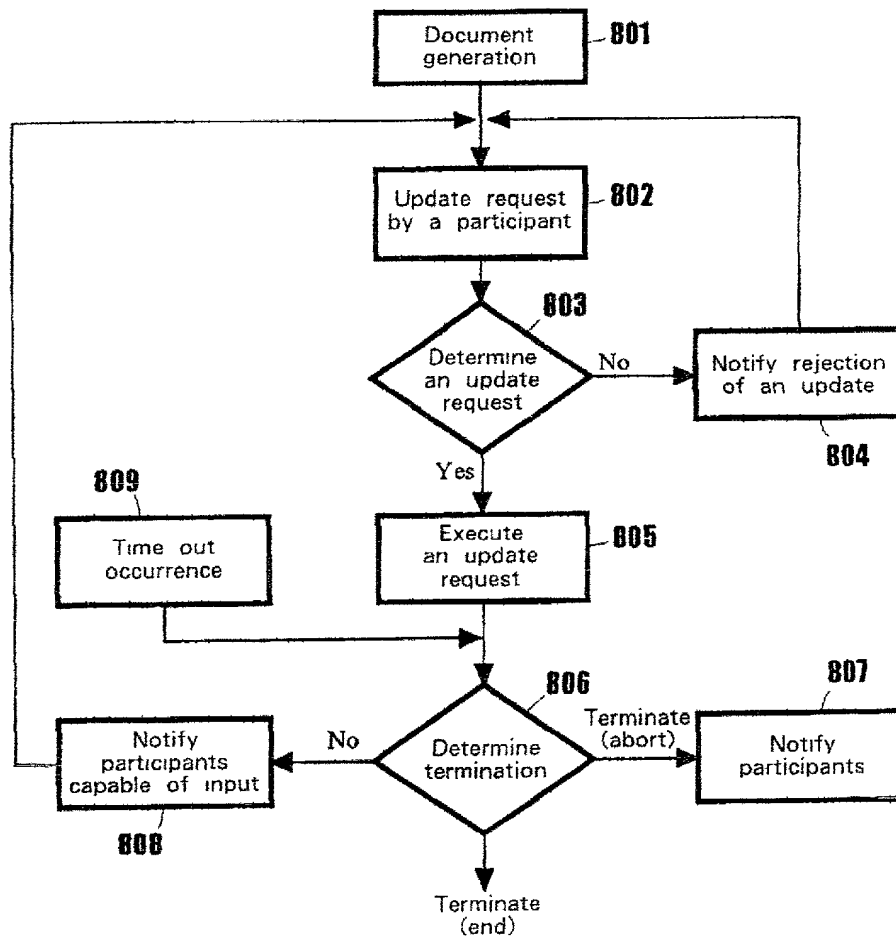
Document data structure

Fig. 6

<p>Contents</p> <p>OrderID= "00001"</p> <p>Consumer</p> <p> ConsumerID= "ConsumerA"</p> <p> Name= "Neyama"</p> <p> Address= "Yamato-shi"</p> <p> Phone= "042-123-4567"</p> <p> DeliveryDateRequested= "21/Sep/1999"</p> <p>Product</p> <p> ProductID= "IBM Aptiva"</p> <p> Price= "99,800 yen"</p> <p> UnitID= "9 116 54.89"</p> <p>Supplier</p> <p> SupplierID= "IBM Corp."</p> <p>Transport</p> <p> Specified= "Kuruneko"</p> <p> Candidate#0= "Pelican"</p> <p> DeliveryDateOffered= "21/Sep/1999"</p> <p> Candidate#1= "Kuruneko"</p> <p> DeliveryDateOffered= "20/Sep/1999"</p> <p> ⋮</p>	<p>History</p> <p>14/Sep/1999-15:20:30,Runtime,w,OrderID</p> <p>14/Sep/1999-15:22:20,Neyama,w,ConsumerID</p> <p>⋮</p> <p>14/Sep/1999-16:37:10,Pelican,c,Candidate#0</p> <p>14/Sep/1999-16:37:20,Pelican,w,Candidate#0</p> <p>Access Control</p> <p>value(ConsumerID),w,Specified</p> <p>Transport,c,Candidate#?,(value(Specified)-ml)</p> <p>Constrains</p> <p>value(DeliveryDateOffer) <= value(DeliveryDateRequested)</p> <p>timeout((isFilled(Specified)isFilled(DeliveryDateRequested)),100)</p> <p>Dependencies</p> <p>ConsumerID, OrderID</p> <p>Candidate#?, DeliveryDateRequested</p> <p>Termination</p> <p>End</p> <p> value(Specified) ! ml</p> <p>Abort</p> <p> ProductID, c,</p> <p> time(Specified, w) > time(DeliveryDateRequested) +</p>
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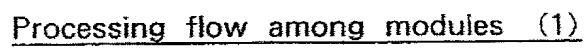
Example of a document

Fig. 7



Operation of a flow control section

Fig. 8

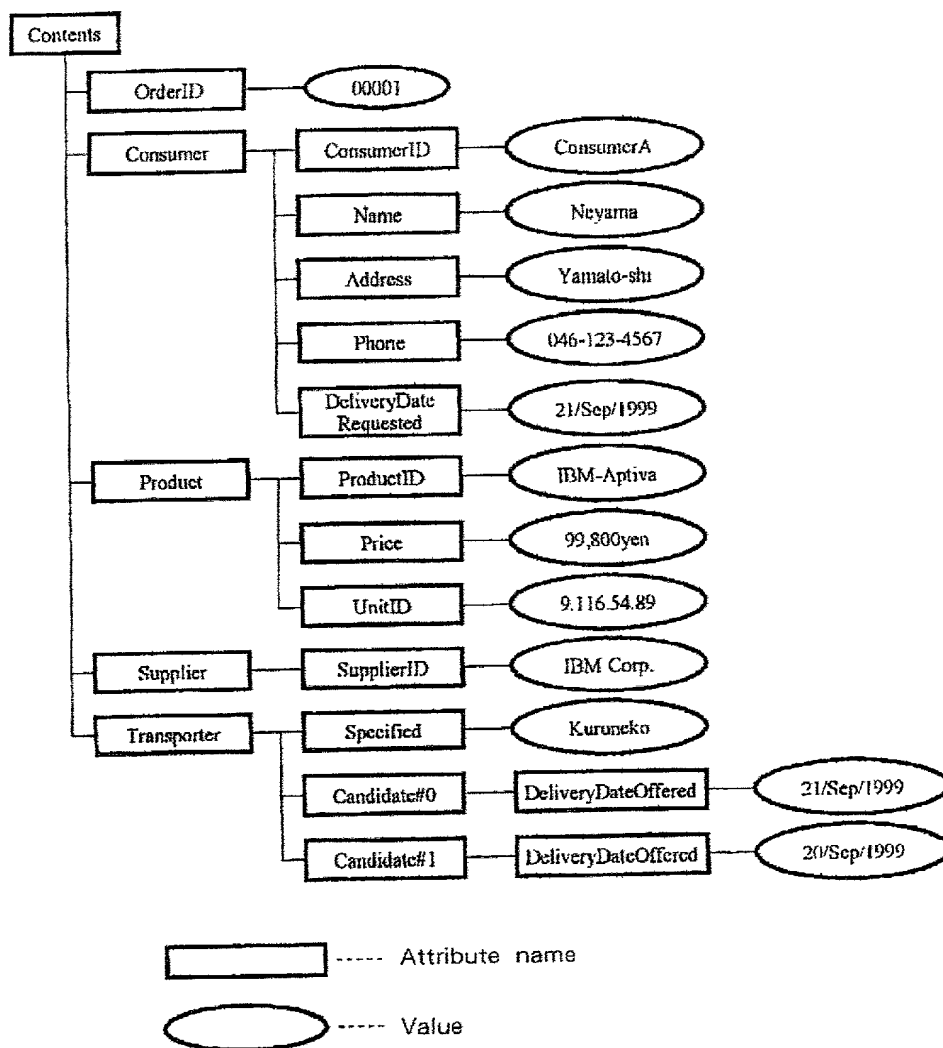


```
sequenceDiagram
    participant P2 as Participant 2
    participant P3 as Participant 3
    participant ICF as Input checking facility
    participant TCMF as Terminating condition managing facility
    participant IEF as Input expediting facility

    TCMF->>IEF: 1001
    ICF->>P2: Notify participants capable of input 1002
    ICF->>P3: Notify participants capable of input 1002
    P3->>ICF: Update request 1003
    ICF->>TCMF: Proceed to next
    TCMF->>TCMF: Determine termination (yes) 1004
    TCMF->>TCMF: Termination 1005
```

Processing flow among modules (2)

Fig. 10



Structure of contents

	Node ID (Attribute name)	Parent node ID (Attribute name)	Value
T0	/	nil	nil
T1	/document	/	nil
T2	/document/contents	/document	nil
T3	/document/contents/OrderID	/document/contents	00001
T4	/document/contents/Consumer	/document/contents	nil
T5	/document/contents/Consumer /ConsumerID	/document/contents /Consumer	Neyama
T6	/document/contents/Consumer /ConsumerID/Name	/document/contents /Consumer	Ryoh Neyama
T7	/document/contents/Consumer /ConsumerID/Address	/document/contents /Consumer	Yamato-shi
T8	/document/contents/Consumer /ConsumerID/Phone	/document/contents /Consumer	046-123-4567

Representation of a tree structure of contents as a table

Order	Time (sec)	Writer ID	Action	Node ID
0	0	Runtime	Write	/document/contents/OrderID
1	100	Neyama	Write	/document/contents/Consumer /ConsumerID
2	100	Neyama	Write	/document/contents/Consumer /Name
3	100	Neyama	Write	/document/contents/Consumer /Address
4	100	Neyama	Write	/document/contents/Consumer /Phone

(Action types : Create, Write, Read, Cancel)

Example of History representation

Fig. 13

Outline part format
 allow(<node>,<user>,<operation>)

Example of rules
 Rule 1
 allow(?Node, ?User, "+w") ←
 isPath(?Node, "/document") and
 hasRole(?User, "Consumer").

Rule 2
 allow(?Node, ?User, "+w") ←
 isPath(?Node, "/ProductID") and
 hasRole(?User, "Consumer") and
 isCreator(?User, ?Node).

Example of Access Control representation

Fig. 14

Constraints 1

Contents : member(TransportSpecified, CompanyID)

Internal representation :

getValue('TransportSpecified',V1) and
 getValueList('CompanyID',V2) and
 member(V1, V2)

Constraints 2

Contents : DeliveryDateOffered <= DeliveryDateRequested

Internal representation :

getValue('DeliveryDateRequested',V1) and
 getValue('DeliveryDateOffered',V2) and
 V1 <= V2

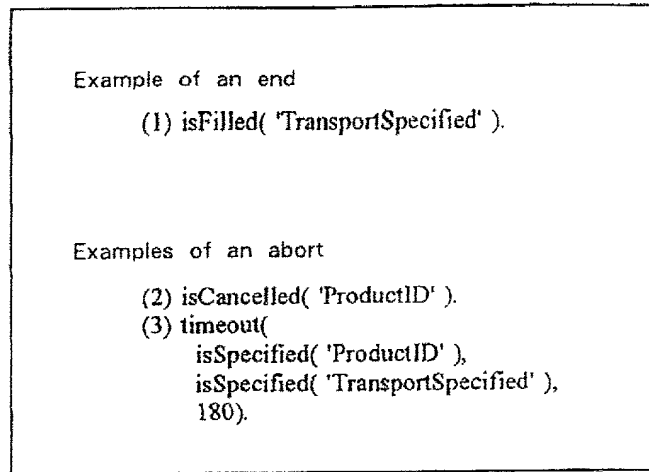
Example of Constraints representation

Fig. 15

Depended node ID	Dependent node ID
ProductID	UnitID
UnitID	TransportInfo
TransportInfo	TransportSpecified

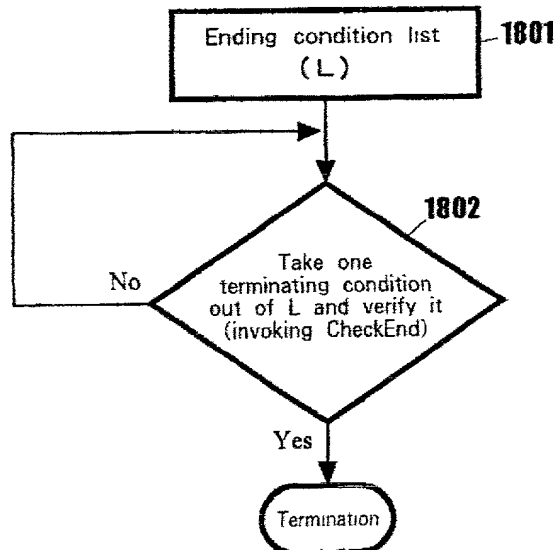
Example of Dependencies representation

Fig. 16



Example of Termination representation

Fig. 17



End determination

Fig. 18

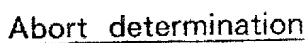


Fig. 19

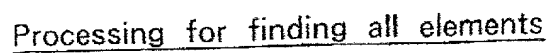
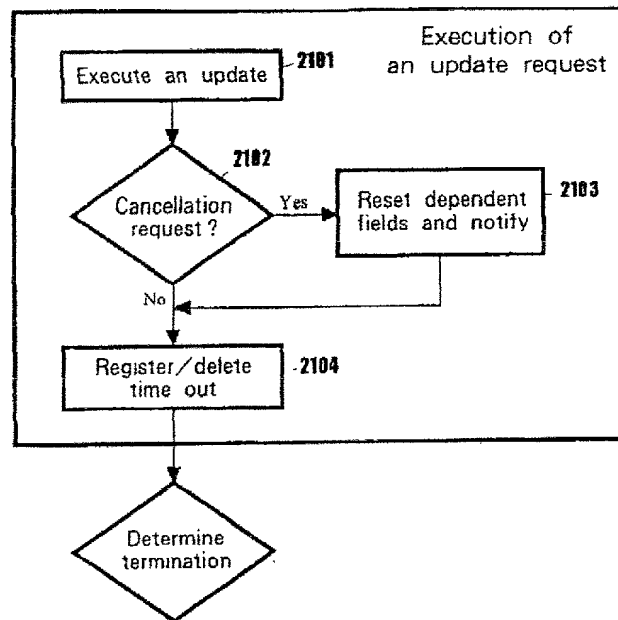


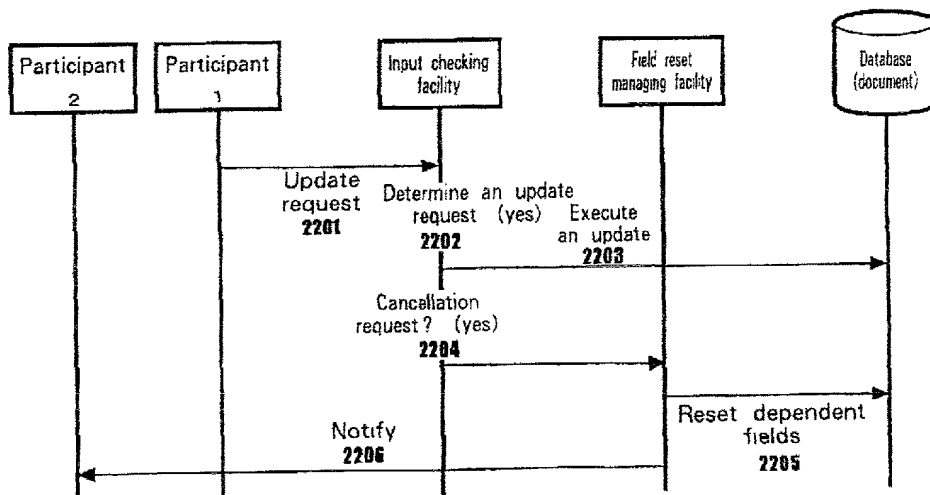
Fig. 20

Physical properties		Chemical properties		Biological properties		Environmental properties	
Parameter	Value	Parameter	Value	Parameter	Value	Parameter	Value
Temperature	25.0	pH	7.2	DO	8.5	Salinity	35.0
Pressure	101.3	Conductivity	500	Turbidity	0.5	Chlorophyll a	0.1
Humidity	65.0	Alkalinity	120	Secchi depth	2.0	Phytoplankton	1.0
Wind speed	10.0	Total suspended solids	100	Water column depth	10.0	Zooplankton	0.5
Wave height	0.5	Dissolved oxygen	8.5	Bottom type	Sand	Macroinvertebrates	0.1
Current speed	0.1	Ammonia	0.1	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Nitrate	0.5	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Phosphate	0.05	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Silicate	0.1	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Iron	0.01	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Copper	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Zinc	0.01	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Manganese	0.01	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Cadmium	0.0001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Lead	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Mercury	0.0001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Chromium	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Nickel	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Cobalt	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Selenium	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Antimony	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Barium	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Bismuth	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Caesium	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Strontium	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Tellurium	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Thallium	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Uranium	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Plutonium	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Neptunium	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Protactinium	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Thorium	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Uranium	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Neptunium	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Protactinium	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Thorium	0.001	Water column depth	10.0	Microinvertebrates	0.05
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Current direction	North	Thorium	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Uranium	0.001	Water column depth	10.0	Microinvertebrates	0.05
Current direction	North	Neptunium	0.001				



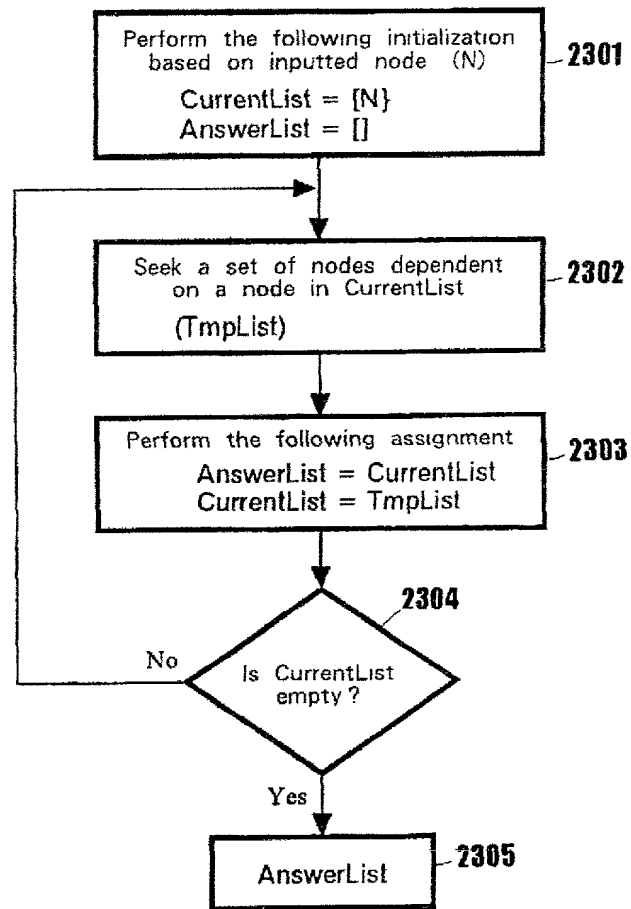
Details of execution of an update request

Fig. 21



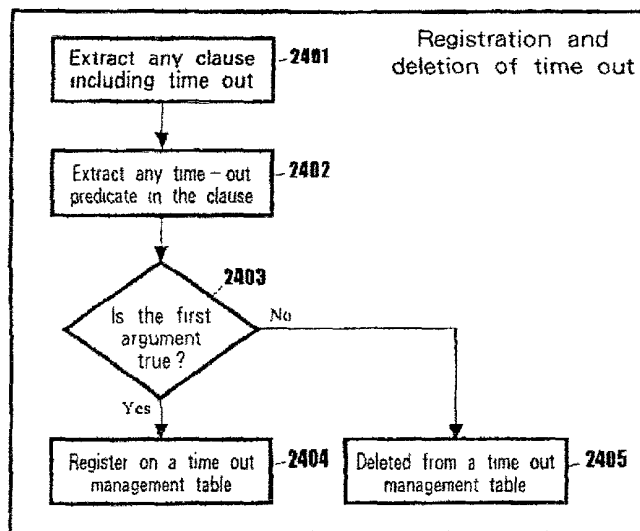
Details of update processing

Fig. 22



Processing for finding dependent nodes

Fig. 23



Details of registration and deletion of time out

Fig. 24

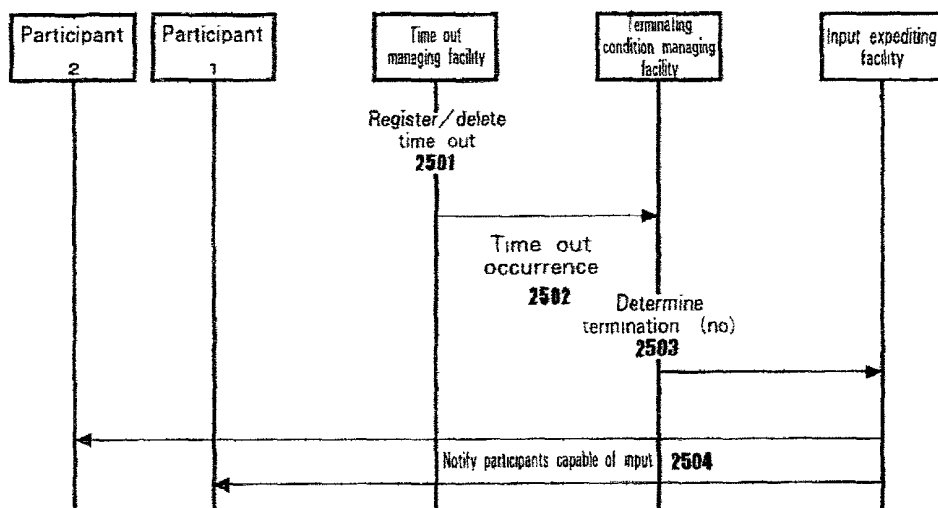


Fig. 25